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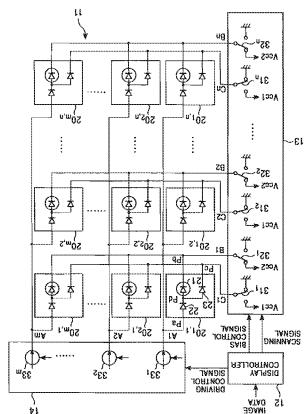
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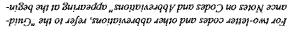
(24) Tire: LIGHT EMITTING CIRCUIT FOR ORGANIC ELECTROLUMINESCENCE ELEMENT AND DISPLAY DEVICE

(57) Abstract: A light emitting circuit and a display device capable of providing refresh action to an organic electroluminescence element to which a diode is connected in series, in a comparatively easy structure, in order to improve the average luminance.



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DESCRIPTION

FIGHT EMITTING CIRCUIT FOR ORGANIC ELECTROLUMINESCENCE

ELEMENT AND DISPLAY DEVICE

Technical Field

The present invention relates to a light emitting circuit for an organic electroluminescence element and a display

yu ejectroluminescence element (hereinafter referred to

Background Art

The voltage V- current I- luminance L characteristic of emits light at light intensity proportional to the current. forming a light emitting layer. As a result, the EL element zige of the diode component E) to an organic functional layer ejectric current starts flowing from the electrode (the anode ewraarou fureaporg nortsde becarrar to fue Er elemeuf, scross the electrodes exceeds the barrier voltage or the light accumulated in the capacity component C. When the voltage the electrodes of the EL element, electric charge is When a light emitting driving DC voltage is applied between can be considered to be a capacitive light emitting element. parallel to the capacity component. Therefore, an EL element sud a component E having a diode characteristic coupled in can be substituted by a constitution of a capacity component C shown in Fig. 1. As can be understood from Fig. 1, an element can be electrically expressed as an equivalent circuit, as ss 'EL element'), which is a capacitive light emitting element,

the EL element is, as shown in Fig. 2, similar to the characteristic of a diode in that the current I is very small

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EL element is equal to or lower than the light emission emitting luminance when the driving voltage V applied to the Tight emission threshold voltage Vth, and shows no light when the driving voltage applied to the EL element exceeds the carreat I which flows in accordance with a driving voltage V ejement spows jidpt emitting luminance proportional to the luminance L are nearly proportional to each other. The EL threshold voltage Vth. Further, the current I and the Vth and increases at a voltage higher than the light emission at a voltage lower than the light emission threshold voltage

piss voltage is applied, it is known that there is refresh direction contrary to the forward direction, namely, a reverse function has deteriorated for repeated light emission, in a Muen a voltage is applied to the EL element of which the

threshold voltage Vth.

As is also still known, in a light emitting circuit for action such that the function of the EL element is recovered.

in a display device for displaying through line scanning of a of the EL element when a scanning time for every line is short ts can be effectively used in improving the average luminance stopping the supply of the driving current. This phenomenon accordance with the driving current, for a while even after accumulated in the capacitive component of the EL element in then maintains the light emission by electric charge, which is to the EL element in series, the EL element emits light, and supplied to the EL element through a diode which is connected making an EL element emit light, when a driving current is

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display panel with a plurality of EL elements arranged in a matrix shape, especially a display panel having a large number

In a light emitting circuit in which a diode is connected to an EL element in series, however, it is difficult to form a structure for applying a reserve bias voltage to the EL element to provide the refresh action.

Disclosure of Invention

of Tines.

emitting circuit for an EL element and a display device capable of providing refresh action to the EL element where a diode is connected in series so as to improve the average luminance, in a comparatively easy structure.

According to the present invention, there is provided a

yu opject ot the present invention is to provide a light

Light emitting circuit for making an organic electroluminescence element emit light in response to a light connected with the organic electroluminescence element in a connected with the organic electroluminescence element in a connected with said organic electroluminescence element at a connected with said organic electroluminescence element at a connected with said organic electroluminescence element at a connected with said organic electroluminescence element for to the polarity direction of the first diode element, driving current supplying means for supplying a driving current for light emission in the forward polarity direction to the serial circuit of said organic electroluminescence element, and said circuit of said organic electroluminescence element and said circuit of said organic electroluminescence element and said

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electroluminescence element and said second diode element in voltage to the serial circuit of said organic rustruction, and reverse blas application means for applying a

the direction contrary to the forward polarity direction of

direction of the first diode element, and said driving means tirst diode element, in a direction contrary to the polatity perween said organic electroluminescence element and said said organic electroluminescence element at a connection point direction in series, and a second diode element connected with oxdanic electroluminescence element in a same polarity ceff includes a first diode element connected with said emifting cell specifying means, wherein said light emifting perud in the light emitting cell specified by said light element emit light, said organic electroluminescence element driving means for making an organic electroluminescence light emitting cells in accordance with input image data; and one light emitting cell to be driven to emit light of said Tight emitting cell specifying means for specifying a least electroluminescence elements are arranged in a matrix shape; Tight emitting cells respectively including organic device comprising: a display panel in which a plurality of yccorqiud to the invention, there is provided a display electroluminescence element does not emit light. said organic electroluminescence element when said organic

driving current for light emission in the forward polarity

rucjnges qriatng current supplying means for supplying a

direction to the serial circuit of said organic

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electroluminescence element and said first diode element in response to the light emission instruction, and reverse bias application means for applying a voltage to the serial circuit diode element in the direction contrary to the forward polarity direction of said organic electroluminescence element polarity direction of said organic electroluminescence element in the direction of said organic electroluminescence element polarity direction of said organic electroluminescence element in the direction of said organic element in the direction organic element in the

said organic electroluminescence element does not emit light. direction of said organic electroluminescence element when element in the direction contrary to the forward polarity organic electroluminescence element and said capacitive means for applying a voltage to the serial circuit of said the light emission instruction; and reverse bias application csbscifive element through said diode element in response to to said organic electroluminescence element and said mesus tor supplying a driving current in the forward direction ejement and said diode element; driving current supplying of the connection point of said organic electroluminescence polarity direction in series; a capacitive element connected with said organic electroluminescence element in a forward emission instruction, comprising: a diode element connected ejectroluminescence element emit light in response to a light 11ght emitting circuit for making an organic According to the present invention, there is provided a

According to the present invention, there is provided a

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sueem. of the driving ourrent by said driving current supplying opposite to said connection point, after finishing the supply potential to one end of said capacitive element on a side and second potential application means for applying the first qioqe ejement in response to the light emission instruction; torward direction to said capacitive element through said carrent supplying means for supplying a driving current in the ejement on a side opposite to the connection point; driving potential, to one end of said organic electroluminescence applying a first potential, which is higher than a reference and said diode element; first potential application means for connection point of said organic electroluminescence element with said organic electroluminescence element at the polarity direction in series; a capacitive element connected with said organic electroluminescence element in a forward emission instruction, comprising: a diode element connected ejectroluminescence element emit light in response to a light

According to the present invention, there is provided a display device comprising: a display panel in which a plurality of light emitting cells respectively including shape; light emitting cell specifying means for specifying a said light emitting cell specifying means for specifying a least one light emitting cell in accordance with input image data; said light emitting cells in accordance with input image data; said light emitting cells in accordance with input image data; said light emitting cells in accordance with input image data; and driving means for making an organic electroluminescence and driving means for making means for making

element emit light, said organic electroluminescence element

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According to the present invention, there is provided a said organic electroluminescence element does not emit light. qrrection of said organic electroluminescence element when element in the direction contrary to the forward polarity organic electroluminescence element and said capacitive means for applying a voltage to the serial circuit of said the light emission instruction, and reverse bias application capacitive element through said diode element in response to direction to said organic electroluminescence element and said anbbyling means for supplying a driving current in the forward grode element, and said driving means includes driving current point of said organic electroluminescence element and said series, and a capacitive element connected at the connection electroluminescence element in a forward polarity direction in ceff includes a diode element connected with said organic emiffing cell specifying means, wherein said light emiffing perud ru tye ridyt ewrttrud cerr abecrtred ph asrd ridyt

display device comprising: a display panel in which a plurality of light emitting cells respectively including calestone elements are arranged in a matrix said light emitting cell to be driven to emit light of and driving means for making an organic electroluminescence shape; light emitting cells in accordance with input image data; and driving means for making an organic electroluminescence said light emitting cells in accordance with input image data; and driving means for making an organic electroluminescence and light emitting cells in accordance with input image data; and driving means for making or light or accordance with input image data; and driving means for making or light emitting cell specifying means for making or light emitting or light

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Fig. 1 shows an equivalent circuit of an EL element. Brief Description of Drawings carrent by said driving carrent supplying means. connection point, after finishing the supply of the driving of said capacitive element on a side opposite to said application means for applying the first potential to one end the light emission instruction, and second potential capacitive element through said diode element in response to supplying a driving current in the forward direction to said connection point, driving current supplying means for efectroluminescence element on a side opposite to the reference potential, to one end of said organic means for applying a first potential, which is higher than a and said driving means includes first potential application organic electroluminescence element and said diode element, electroluminescence element at the connection point of said series, and a capacitive element connected with said organic electroluminescence element in a forward polarity direction in juctudes a diode element connected with said organic

Fig. 2 schematically shows the driving voltage - current -

Fig. 3 is a block diagram showing an embodiment of the luminance characteristic of the EL element.

Fig. 4 shows a potential in each operation mode of each present invention.

Fig. 5 is a block diagram showing another embodiment of point of a light emitting cell of Fig. 3.

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the present invention.

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point of the Light emitting cell of Fig. 5. Fig. 6 shows a potential in each operation mode of each

- Fig. 7 is a block diagram showing another embodiment of
- the present invention.
- Fig. 8 shows a potential in each operation mode of each
- Fig. 9 is a block diagram showing another embodiment of point of the light emitting cell of Fig. 7.
- Fig. 10 shows a potential in each operation mode of each the present invention.
- point of the light emitting cell of Fig. 9.
- Fig. 11 is a block diagram showing another embodiment of
- the present invention.
- Fig. 12 shows a potential in each operation mode of each
- Detailed Description of the Invention point of the light emitting cell of Fig. 11.
- described in details with reference to the drawings. Hereinaffer, embodiments of the present invention will be

ktg. 3 shows the structure of a display device to which

scanning reverse bias circuit 13, and a driving current combrises a display panel 11, a display controller 12, a the present invention is adopted. The display device

supplying circuit 14.

 $20_{1,1}$ to $20_{m,u}$ in the respective intersections formed by the being arranged in a matrix shape, and light emitting cells lines Bl to Bn in the horizontal direction (line direction) driving lines Al to Am in the vertical direction and scanning As illustrated in Fig. 3, the display panel 11 includes

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driving lines Al to Am and the scanning lines Bl to Bn. The display panel ll further includes reverse bias lines Cl to Cn in parallel to the respective scanning lines Bl to Bn.

The light emitting cells $20_{1,1}$ to $20_{m,n}$ all consist of the same components. Taking the light emitting cell $20_{1,1}$ as an example, for the sake of explanation, it is provided with an Libereof is connected to the driving line Al and the cathode clement 21 and the anode of the double 23. The negative electrode of the EL element 21 and the snode of the diode 23. The negative electrode of the EL element 21 is connected to the gosifive electrode of the scanning electrode of the EL element 21 is and the snode of the diode 23. The negative electrode of the EL element 21 is connected to the electrode of the EL element 21 is and the snode of the diode 23 is connected to the line Bl and the cathode of the diode 23 is connected to the line Bl and the cathode of the diode 23 is connected to the

The display controller l2 generates a bias control

signal, a driving control signal, and a scanning signal based on an input image data. The scanning signal is a signal for selecting one scanning line in turn, of the scanning lines Bl to Bn during one frame. The driving control signal is a signal for instructing supply of a driving current to at least one of the driving lines Al to Am, corresponding to the EL the EL elements of m light emitting cells on the one scanning line. The bias control signal is a signal for selecting one liming later than the scanning timing later than the scanning signal and instructing application of a reverse bias voltage signal and instructing application of a reverse bias voltage to the EL elements of m light emitting cells on the scanning

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reverse bias line. The scanning signal and the bias control signal are supplied to a scanning reverse bias circuit 13 and the driving control signal is supplied to a driving current supplying circuit 14.

The scanning reverse bias circuit 13 includes reverse

bias switches $3l_1$ to $3l_p$ and scanning switches $3\lambda_1$ to $3\lambda_n$, which are respectively connected to the reverse bias lines C1 to Cn and the scanning lines B1 to Bn. The reverse bias switches $3l_1$ to $3l_n$ are provided corresponding to the reverse bias lines C1 to Cn, so as to supply one of a potential Vccl and a ground potential (reference potential) selectively to the respective control signal. The scanning switches $3\lambda_1$ to $3\lambda_n$ are provided corresponding to the scanning lines B1 to Bn, so as to supply corresponding to the scanning lines B1 to Bn, so as to supply corresponding to the scanning lines B1 to Bn, in accordance with to the respective scanning lines B1 to Bn, in accordance with the scanning signal. Here, Vccl>Vccl>Vccl.

sources 33_1 to 33_n , which are respectively connected to the driving lines Al to Am. The current sources 33_1 to 33_m supply a driving current to at least one of the driving lines Al to Am in accordance with the driving control signal.

In the display device constituted above, the operation in

The driving current supplying circuit if includes current

the case of making the KL element 21 of the light emitting described with reference to Fig. 4. In the description, a potential (potential of the driving line Al) applied to the

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anode end of the diode 22 is defined as Pa, a potential (potential of the scanning line B1) applied to the negative electrode of the EL element 21 is defined as Pb, a potential of the reverse bias line C1) applied to the cathode end of the diode 23 is defined as Pc, and a potential applied to the positive electrode of the EL element 21 is defined as Pd, as illustrated in Pig. 3.

are a scanning mode for scanning the line of the light emitting cells $20_{1,1}$ to $20_{m,1}$, a light emission continuous mode for maintaining light emission of the EL element 21 just after finishing the scan, and a reverse bias application mode for applying a reverse bias voltage to the EL element 21, as applying a reverse bias voltage to the EL element 21, as

In the case of light emission of the EL element 21, there

illustrated in Fig. 4. In the scanning mode, the reverse bias switch $3l_1$ and the

scanning switch $3\lambda_1$ each perform a switching operation in accordance with a scanning signal from the display controller l2, the reverse bias switch $3l_1$ relays the potential Vccl to the reverse bias line Cl, and the scanning switch $3\lambda_1$ relays the ground potential to the scanning line Bl. Simultaneously with the relay operations, the current source 33_1 supplies the with the relay operations, the current source 33_1 supplies the driving current to the driving line Al in accordance with a driving control signal from the display controller l2.

Namely, since the diode 22 turns on, the driving current from the current source 33_1 flows into the ground through the driving line Al, the diode 22, the EL element 21, the scanning

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line Bl, and the switch $3\lambda_1$. The EL element 21 emits light by the flow of the driving current. Further, the driving current charges the capacitive component of the EL element 21.

The potential Pa of the driving line Al becomes, for example, about 10V, the potential Pb of the scanning line Bl becomes 0V that is the ground potential, the potential Pc of the reverse bias line Cl becomes Vccl, and the positive electrode potential Pd of the EL element 2l becomes about 7V. Since there is a relationabip of Vccl>Vcc2>7V, the diode 23 is in a reverse bias state, and electric charge is stored into the depletion layer capacitor of the diode 23.

When a scanning time assigned to the scanning line Bl passes, the contents of the scanning signal and the driving control signal from the display controller 12 are changed, the scanning line Bl is finished, and the selected scanning line Bl is finished, and the scanning line Bl. Thus, the light emission continuous mode is started. Since the scanning switch 32, performs a switching operation, the potential Voc2 is relayed to the scanning line Bl, and simultaneously, the current source 33, stops a supply of the driving current to the current source 33, stops a supply of the driving current to the

of the driving line Al becomes OV, the potential Pb of the scanning line Bl becomes Vcc2, and the potential Pc of the reverse bias line Cl remains at Vccl. Since the capacitive component in the El element 21 has accumulated charge, and the depletion layer capacitor of the diode 23 also has the

In the light emission continuous mode, the potential Pa

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accumulated charge, the accumulated charges flow into the diode component of the EL element 21 as a driving current in the forward direction, so as to maintain the light emission of potential Pd of the EL element 21 becomes about Vcc2+5V. The EL element 21 stops the light emission when the voltage across EL element 21 in the forward direction becomes lower than the EL element 21 in the forward direction becomes lower than a light emission threshold voltage Vth in accordance with

decrease of the accumulated charges.

Mnen a blas control signal from the display controller l2

is generated, the reverse bias application mode is started. In the scanning reverse bias circuit 13, the reverse bias switching operation in response to the bias control signal so as to supply the ground potential 0V, this time point, since the positive electrode potential Pd of the potential Pd of the scanning line Bl and the potential Vcc2 at the potential Pb of the scanning line Bl and the potential of the residual charge of the BL element 21, the diode 23 turns on. By the turning-on of the BL element 21, the positive electrode potential Pd is substantially changed to positive electrode potential Pd is substantially changed to positive electrode potential Pd is substantially changed to the ground potential 0V. Accordingly, the EL element 21 is in the stream the reverse bias state and is provided with refresh action.

Even when the reverse bias switch 31, and the scanning a reverse bias state and is provided with refresh action.

switch 32_1 have performed the switching operation, in accordance with a scanning signal from the display controller ly for the scanning signal from the display controller accordance with a scanning signal from the scanning mode.

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where the EL element 21 does not emit light, the current source 33_1 is in an inactive state and does not supply a driving current to the driving line Al. The positive electrode potential Pd at this time becomes about 3V.

A display device of Fig. 5 includes a display panel 11, a display controller 12, a scanning reverse bias circuit 13, and display device of Fig. 3. The display panel 11 and the display controller 12 are the same as those of Fig. 3.

The scanning reserve bias circuit 13 includes reverse

Fig. 5 shows another embodiment of the present invention.

bias switches $4l_1$ to $4l_n$ and scanning switches $4\aleph_1$ to $4\aleph_n$, which are respectively connected to the reverse bias lines C1 to Cn and the scanning lines B1 to Bn. The reverse bias switches $4l_1$ to $4l_n$ are provided corresponding to the reverse bias lines C1 to Cn, so as to supply one of a potential Vccl, and a ground potential selectively to the respective signal. The scanning switches $4\aleph_1$ to $4\aleph_n$ are provided corresponding to the scanning lines B1 to Bn, so as to supply corresponding to the scanning lines B1 to Bn, so as to supply one of a potential Vcc3 and the ground potential selectively one of a ground switches $4\aleph_1$ to $4\aleph_n$ are provided to the scanning signal. Here, there are relationships of vortexpords and vcc1-Vcc2-Vcc3.

The driving current supplying circuit 14 includes current

sources 33_1 to 33_n and switches 43_1 to 43_n , which are respectively connected to the driving lines Al to Am. The

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current sources 33_1 to 33_m supply a driving current to any of the driving lines Al to Am in accordance with a driving control signal. The switches 43_1 to 43_m are turned on to change the potentials of the driving lines Al to Am to the ground potential respectively in response to the driving ground potential respectively in response to the driving

control signal.

In the display device constituted as shown in Fig. 5, the

operation in the case where the display controller 12 makes the EL element 21 of the light emitting cell $20_{1,1}$ emit light will be described with reference to Fig. 6. There are a scanning mode for scanning the lime of the light emitting cells $20_{1,1}$ to $20_{n,1}$, a light emission continuous mode for maintaining light emission of the EL element 21 just after finishing the scan, and a reverse bias application mode for finishing the scan, and a reverse bias application mode for finishing a reverse bias voltage to the EL element 21, as

illustrated in Fig. 6. In the scanning mode, the reverse bias switch $4l_1$ and the

scanning switch 42_1 each perform a switching operation in accordance with a scanning signal from the display controller l2, the reserve bias switch 41_1 relays the potential Vcc2 to the reverse bias line Cl, and the scanning switch 42_1 relays the ground potential to the scanning line Bl. Simultaneously with these relay operations, in accordance with a driving control signal from the display controller l2, for the light control signal from the display controller l2, for the light emission of the EL element 21, the current source 33_1 operates emission of the EL element 21, the current source 33_1 operates switch 43_1 is turned off.

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Since the diode 22 turns on, the driving current from the current source 33_1 flows into the ground through the driving line line Al, the diode 22, the EL element 21, the driving current makes EL element 21 emit light. The driving current charges the capacitive component of the EL element 21.

The potential Pa of the driving line Al becomes, for example, about 10V, the potential Pb of the scanning line Bl becomes 0V that is the ground potential, the potential Pc of the reverse bias line Cl becomes Vcc2, and the positive electrode potential Pd of the El element 2l becomes about 7V. Since there is a relationship of Vccl>Vcc2>7V, the diode 23 is in a reverse bias state and electric charge is stored into the in a reverse bias state and electric charge is stored into the depletion layer capacitor of the diode 23.

When a scanning time assigned to the scanning line Bl

passes, it turns into the light emission continuous mode. In the light emission continuous mode, the contents of the scanning signal and the driving control signal from the display controller 12 are changed, the scan of the scanning line B1 is finished, and the selected scanning line is shifted to the scanning line B2. Thus, the reverse bias switch 42, each perform a switching operation. The reverse bias switch 42, each perform a switching operation. The reverse bias switch 41, relays the potential Vcc1 to the reverse bias line C1, and the scanning switch 42, relays the potential Vcc3 to the scanning line B1. Simultaneously, the current source 33, stops the supply of the driving current to the driving line A1 and the switch 43, is turned on,

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alternatively, it supplies the driving current to the driving line Al again, for the light emission of the EL element of the Light emitting cell at the intersection of another selected scanning line and the driving line Al and the switch 43, is

In the light emission continuous mode, when stopping the

the accumulated charges. Thus, the light emission continuous voltage Vth (for example, 3V) in accordance with a decrease of direction becomes lower than the light emission threshold when the voltage across the KL element 21 in the forward The EL element 21 stops the light emission about Vcc3+7V. bositive electrode potential Pd of the EL element 21 becomes the light emission of the EL element 21. Accordingly, the a driving current in the forward direction, so as to maintain cysxdes ifow into the diode component of the EL element 21 as diode 23 also has the accumulated charge, the accumulated accumulated charge and the depletion layer capacitor of the Stace the capacitive component in the EL element 21 has the potential Pc of the reverse bias line Cl increases to Vccl. Pb of the scanning line Bl increases to Vcc3, and the potential Pa of the driving line Al becomes OV, the potential supply of the driving current to the driving line Al, the

When the bias control signal from the display controller la generated, the reverse bias application mode, the reverse bias supplication mode, the reverse bias switch 41_1 in the scanning reverse bias circuit 13 performs a

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turned off.

switching operation in response to the bias control signal from the display controller 12, so as to supply the ground potential OV instead of the potential Vacl to the reverse bias line Cl. At this time point, since the positive electrode potential Pd of the EL element 21 is a potential level potential Pd of the PD potential Vac3 at the potential Pb of

potential Pd of the EL element 21 is a potential level obtained by adding the potential Vcc3 at the potential Pb of the scanning line Bl and the potential of the residual charge of the EL element 21, the diode 23 turns on. By the turning-on of the diode 23, the positive electrode potential Pd is substantially changed to a voltage of the diode 23. Since the which is equal to the on-voltage of the diode 23. Since the positive electrode potential Pd is lower than the potential Vcc3 of the potential Pd, the EL element 21 is in a reverse vcc3 of the potential Pb, the EL element 21 is in a reverse vcc3 of the potential Pb, the EL element 21 is in a reverse vcc3 of the potential Pb, the EL element 21 is in a reverse vcc3 of the potential Pb, the EL element 21 is in a reverse vcc3 of the potential Pb, the EL element 21 is in a reverse vcc3 of the potential Pb, the EL element 21 is in a reverse vcc3 of the potential Pb, the EL element 21 is in a reverse vcc3 of the potential Pb, the EL element 21 is in a reverse vcc3 of the potential Pb, the EL element 21 is in a reverse vcc3 of the potential Pb, the EL element 21 is in a reverse vcc3 of the potential Pb.

switch 42_1 have performed the switching operation in response to the scanning signal from the display controller 12, for the scanning line B1, in the scanning mode where the an inactive state and does not supply a driving current to the an inactive state and does not supply a driving current to the driving line A1 and the switch 43_1 is turned on. The positive electrode potential Pd at this time becomes about 3V.

Even when the reverse bias switch 41_1 and the scanning

Fig. 7 shows another embodiment of the present invention. A display device in Fig. 7 is designed so that the potential Vcc3 is always applied to the scanning lines Bl to Bn, without having the scanning switches 42_1 to 42_n in the scanning reverse bias circuit 13 shown in Fig. 5. The other structure is the

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same as that of the display device of Fig. 5.

In the display device constituted as shown in Fig. 7, the

operation in the case where the display controller 12 makes the EL element 21 of the Light emitting cell $20_{1,1}$ emit light will be described with reference to Fig. 8.

In the scanning mode, the reverse bias switch 41_1 performs

a switching operation in accordance with a scanning signal from the display controller 12 so as to relay the potential Vcc2 to the reverse bias line Cl. Simultaneously with the relay operation, in response to a driving control signal from the display controller 12, the current source 33_1 operates to supply a driving current to the driving line Al, for the light supply a driving current to the driving line Al, for the light supply a driving current to the driving line Al, and the switch 43_1 is turned

off. Since the diode 22 turns on, the driving current from the

current source 33, flows into the power source (not illustrated) of the potential Vcc3 through the driving line Al, the diode 22, the EL element 21, and the scanning line Bl. This flow of the driving current makes the EL element 21 emit light. The driving current charges the EL element 21 emit of the EL element 21.

The potential Pa of the driving line Al becomes, for example, Vcc3+10V, the positive electrode potential Pd of the EL element 21 becomes about Vcc3+7V. Since there is a relationship of Vcc1>Vcc3+7V, the diode 23 is in a reverse bias state and electric charge is stored into the depletion bias state and electric charge is stored into the depletion.

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When a scanning time assigned to the scanning line Bi passes, the contents of the scanning signal and the driving control signal from the display controller 12 are changed and the selected scanning line is shifted to the scanning line BZ though the potential of the scanning line BI remains at Vcc3. Thus, the light emission continuous mode is started, and the teverse bias switch 41, performs a switching operation to relay the potential Vcc1 to the reverse bias line Cl.

Simultaneously with the switch operation, the current source and the supply of the driving current to the driving line Al, for the light emission of the EL element of the Light emitting cell at the intersection of another selected scanning line and the driving intersection of another selected scanning line and the driving intersection of another selected scanning line and the driving intersection of another selected scanning line and the driving intersection of another selected scanning line and the driving intersection of another selected scanning line and the driving intersection of another selected scanning line and the driving intersection of another selected accounting line and the driving intersection of another selected accounting line and the driving line and line and

of the driving line Al becomes OV and the potential Pc of the reverse bias line Cl increases to Vccl when stopping the supply of the driving current to the driving line Al. Since the capacitive component in the EL element 21 has the accumulated charge and the depletion layer capacitor of the diode 23 also has the accumulated charge, the accumulated charges flow into the diode component of the EL element 21 as a driving current in the forward direction, so as to maintain the light emission of the EL element 21.

In the light emission continuous mode, the potential Pa

line Al and the switch 43, is turned off.

The positive electrode potential Pd of the EL element 21 is increased by $V\gamma=VccL\times Cd23+(Cd23+Cell)$ by functioning the

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both capacities of the charged capacity Cell of the EL element 21 and the charged capacity Cd23 of the diode 23. The EL element 21 stops the light emission when the voltage in the forward direction of the EL element 21 becomes lower than the light emission threshold voltage Vth (for example, 3V) in accordance with to a decrease of the accumulated charges, thereby finishing the light emission continuous mode.

Assuming that the positive electrode potential Pd at the time of maintaining the light emission of the EL element 21 is $V\gamma=Vcc3+V\alpha$, the positive electrode potential Pd becomes $Vcc3+V\alpha-V\gamma$ when the EL element 21 emits light at a selection of the next scanning line Bl. Here, $V\alpha$ is about VV.

display controller 12, the reverse bias application mode is started. In the reverse bias application mode, similarly to the device of Fig. 5, in the scanning reverse bias circuit 13, the reverse bias switch 41, performs the switching operation, according to a bias control signal and supplies the ground potential 0V, instead of the potential Vcc1, to the reverse bias line Cl. At this point, since the positive electrode optained by adding the potential Vcc3 at the potential Pb of the scanning line Bl and the potential of the residual charges, the diode 23 is turned on. By turning on the diode 23, in the potential Pd is changed to the potential (for example, 1 to 2 V) equal to the on-voltage of potential (for example, 1 to 2 V) equal to the on-voltage of the diode 23. Since the positive electrode potential Pd is

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lower than Vcc3 at the potential Pb, the EL element 21 is in a reverse bias state and is provided with refresh action.

Even when the reverse bias switch $4l_1$ has performed the switching operation in accordance with a scanning signal from the display controller 12, for the scan of the scanning line Bl, in the scanning mode where the EL element does not emit light, the current source 33_1 is in an inactive and does not supply a driving current to the driving line Al, and the switch 43_1 is turned on. The positive electrode potential Pd switch 43_1 is turned on. The positive electrode potential Pd of the EL element 21 becomes Vcc3+Vc-Vy. Vo is about 3V.

In the above-mentioned respective embodiments, although one Light emitting cell is shown per one pixel, three Light emitting cell, a green Light emitting cell, and a blue Light emitting cell, are formed in one pixel, in a color display matrix typed display panel.

In the above embodiments, it is not necessary to supply a

bias control signal from the display control circuit 12 for each scan. For example, the bias control signal may be supplied once every scans by a predetermined number of times.

Fig. 9 shows the structure of a display device to which the present invention is adopted. The display device includes

As illustrated in Fig. 9, the display panel 11 includes driving lines Al to Am in the vertical direction and scanning

Fig. 3.

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lines Bl to Bn in the horizontal direction (line direction) being arranged in a matrix shape, and light emitting cells $20_{1,1}$ to $20_{m,n}$ in the respective intersections formed by the driving lines Al to Am and the scanning lines Bl to Bn. The display panel ll further includes reverse bias lines Cl to Cn in parallel to the respective scanning lines Bl to Bn.

The light emitting cells $20_{1,1}$ to $20_{m,n}$ all consist of the same components. Taking the light emitting cell $20_{1,1}$ as an example, for the sake of explanation, it is provided with an the diode 22 is connected to the driving line Al and the cathode thereof is connected to the positive electrode of the cathode thereof is connected to the megative electrode of the scanning allowed the EL element 21 and one end of the capacitor 24. The negative electrode of the scanning allowed the EL element 21 and one end of the capacitor 24. The negative electrode of the EL element 21 is connected to the scanning allowed the EL element 21 and one end of the capacitor 24 is connected to the reverse bias line Cl.

signal, a driving control signal, and a scanning signal based on an input image data. The scanning signal is a signal for selecting one scanning line in turn, of the scanning lines Bl signal for instructing supply of a driving current to at least one of the driving lines Al to Am, corresponding to the EL element to be made emit light depending on the image data, of the EL elements of m light emitting cells on the one scanning the EL elements of m light emitting cells on the one scanning the EL elements of made emit light emitting cells on the one scanning the EL elements of made emit light emitting cells on the one scanning the EL elements of made emit light emitting cells on the bias control signal is a signal for selecting one teverse bias line of the reverse bias lines of the reverse bias lines.

The display controller is generates a bias control

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timing later than the scanning timing based on the scanning signal and instructing application of a reverse bias voltage to the EL elements of m light emitting cells on the one reverse bias line. The scanning signal and the bias control signal are supplied to a scanning reverse bias circuit 13 and the driving control signal is supplying circuit 14.

The scanning reverse bias circuit 13 includes reverse

bias switches 31, to 31, and scanning switches 32, to 32, which are respectively connected to the reverse bias lines CI to Cn and the scanning lines Bl to Bn. The reverse bias switches 31, to 31, are provided corresponding to the reverse bias lines CI to Cn, so as to supply one of a potential Vcc and a ground potential (reference potential) selectively to the respective control signal. The scanning switches 32, to 32, are provided corresponding to the scanning lines Bl to Bn, so as to supply corresponding to the scanning lines Bl to Bn, so as to supply one of the potential Vcc and the ground potential selectively one of the potential vcc and the ground signal. Here, there is a relationship of Vcc>7V. The scanning signal. Here, there is a relationship of Vcc>7V.

sources 33_1 to 33_m and switches 43_1 to 43_m , which are respectively connected to the driving lines Al to Am. The current sources 33_1 to 33_m supply a driving current to any of the driving lines Al to Am in accordance with a driving control signal. The switches 43_1 to 43_m respectively supply control signal. The switches 43_1 to 43_m respectively supply the ground potential to the driving lines Al to Am in

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accordance with the driving control signal.

In the display device constituted above, the operation in

the case of making the EL element 21 of the light emitting cell 20_{1,1} emit light by the display controller 12 will be describtion, a potential (potential of the driving line Al) applied to the anode end of the diode 22 is defined as Pa, a potential (potential of the scanning line Bl) applied to the negative electrode of the EL element 21 is defined as Pb, a potential (potential of the reverse bias line Cl) applied to the other applied to the reverse bias line Cl) applied to the other potential of the positive electrode of the EL element 21 is defined as Pd, as illustrated in Fig. 9.

are a scanning mode for scanning the line of the light emitting cells $20_{a,1}$ to $20_{a,1}$, a light emission continuous mode for maintaining light emission of the EL element 21 just after finishing the scan, and a reverse bias application mode for applying a reverse bias voltage to the EL element 21, as operation modes of the light emitting cell $20_{1,1}$, as

In the case of light emission of the EL element 21, there

illustrated in Fig. 10. In the scanning mode, the reverse bias switch $3l_1$ and the

scanning switch $3\Omega_1$ each perform a switching operation in accordance with a scanning signal from the display controller i. The reverse bias line Cl, and the scanning switch $3\Omega_1$ relays to the reverse bias line Cl, and the scanning switch $3\Omega_1$ relays to the ground potential 0V to the scanning line Bl.

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Simultaneously with the above relay operations, the current source 33_1 supplies a driving current to the driving line Al in accordance with a driving control signal from the display controller 12, for the purpose of the light emission of the EL controller 31, and the switch 43_1 is turned off.

Since the diode 22 turns on, the driving current from the

current source 33, flows into the ground through the driving line Al, the diode 22, the EL element 21, the scanning line Bl, and the awitch 32,. The EL element 21 emits light by the flow of the driving current. Further, the driving current charges the capacitive component of the EL element 21.

Further, part of the driving current from the current source further, part of the ground through the diode 22, the capacitor 33, flows into the ground through the diode 22, the capacitor charge the capacitor 24, and the reverse bias switch 31, as a charging current, to charge the capacitor 24.

Line Al becomes, for example, about 10V, the potential Pb of the scanning line Bl and the potential Pc of the reverse bias line Cl become 0V that is the ground potential, and the positive electrode potential Pd of the EL element 2l becomes about 7V.

In the scanning mode, the potential Pa of the driving

When a scanning time assigned to the scanning line Bl passes, the light emission continuous mode is started. In the signal and the driving control signal from the display controller 12 are changed, the scan of the scanning line Bl is finished, and the selected scanning line is is finished, and the selected scanning line is similar to the

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scanning line B2. Thus, the reverse bias switch $3l_1$ and the acanning line B2. Thus, the reverse bias switch 32_1 each perform a switching operation. The bias line C1, and the scanning switch 32_1 relays the potential Vcc to the scanning line B1. Simultaneously with the switching operations, the current source 33_1 stops the supply of the driving current to the driving line A1 and the switch of the driving current and the switch of the driving current to the driving current of the driving current samples a driving current 43_1 is turned on, alternatively, it supplies a driving current

to the driving line Al for light emission of the KL element of the light emitting cell at the intersection of another selected scanning line and the driving line Al, and the switch

43, is turned off. In the light emission continuous mode, when the supply of

the driving current to the driving line Al is stopped, the potential Pa of the driving line Al becomes OV and the diode as turns off. The potential Pb of the scanning line Bl and the potential Pc of the reverse bias line Cl increase to Vcc. Since the capacitive component in the EL element 31 has the accumulated charge and the capacitor 24 has the accumulated charge and the capacitor 24 has the accumulated of the EL element 31 has the diverse of the EL element 31 has a driving current in the forward direction so as to maintain the light emission of the EL element 31, Accordingly, assuming that the positive electrode element 31, Accordingly, assuming that the positive electrode potential Pd of the EL element 31 is about Vcc+Vx, Vx=7V. The potential Pd of the EL element 31 is about Vcc+Vx, Vx=7V. The

direction so as to maintain the light emission of the EL element 21. Accordingly, assuming that the positive electrode potential Pd of the EL element 21 is about $Vcc+V\alpha$, $V\alpha=7V$. The EL element 21 stops light emission when the voltage across the EL element 21 in the forward direction becomes lower than the Light emission threshold voltage Vcc in the forward direction becomes lower than the

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accordance with a decrease of the accumulated charges and the

When a bias control signal from the display controller l2

is generated, the reverse bias application mode is started.

In the reverse bias application mode, the reverse bias switch all in the scanning reverse bias circuit 13 performs a switching operation in response to a bias control signal from the display controller 12 so as to supply the ground potential to instead of the potential Vcc to the reverse bias line Cl. A change from the potential Vcc to 0V at the other end of the capacitor 24 on the side of the reverse bias line Cl means a change in the potential at the one end on the opposite side of the capacitor 24, namely, the positive electrode potential Pd of the KL element 21. The current source 33, stops the supply of the KL element 21. The current source 33, stops the supply of the KL element 21. The current source 33, stops the supply of the kL element 21. The current source 33, stops the supply of the kL element 21. The current source 33, stops the supply of the triving current to the driving line Al and the switch of the turned on.

Assume that the positive electrode potential Pd of the EL element 21 after the potential change of the reverse bias line C1 is represented by Vα+Vβ. Vα=3V is maintained. Further, assuming that the charged capacity of the capacitor 24 is C24, Vβ is a voltage obtained by dividing the potential Vcc by two charged capacities Cell and C24, namely Vβ=

Vcc×Cell/(Cell+C24). The forward voltage Vell between the terminals of the EL element 21 becomes Vα+Vβ-Vcc.

When the potential Vcc is set at a fairly high Level and, for example, C24 is set two to four times larger than Cell so

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as to satisfy the relationship of CA4>Cell, the voltage Vell between the terminals of the EL element Al becomes lower than OV. Thus, the EL element Al is in a reverse bias state and is provided with refresh action.

In the reverse bias application mode, since the residual

charges of the capacitor 24 and the EL element 21 remain as they are, the positive electrode potential Pd is maintained. When the reverse bias application mode is finished in accordance with a disappearance of the bias control signal from the display controller 12, the reverse bias switch 31, the reverse bias switching operation to relays the potential Vcc to the reverse bias line Cl similarly to the case of the light emission continuous mode. The positive electrode potential Pd of the EL element 21 increases by Vcc and returns into a potential level obtained by adding the potential Vcc at the potential Pb of the scanning line Bl and the potential of the potential Pb of the scanning line Bl and the potential of the residual charges.

switch 32_1 have performed the switching operation in accordance with a scanning signal from the display controller 12, for the scanning signal from the display controller 12, for the scanning in the scanning mode where the an inactive and the switch 43_1 is in on. Thus, no driving an inactive and the switch 43_1 is in on. Thus, no driving current is supplied to the driving line Al. The positive electrode potential Pd at this time becomes about 3V.

In the above embodiments, it is not necessary to supply a

gneu when the reverse bias switch 31, and the scanning

In the above embodiments, it is not necessary to supply a bias control signal from the display controller l2 in every

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scan. For example, the bias control signal may be supplied once every scans by a predetermined number of times.

In the above-mentioned embodiments, the driving lines Al to Am have the ground potential, respectively by the switches 43_1 to 43_m . At the inactive time of each of the current sources 33_1 to 33_m , if the output line thereof becomes the ground potential, the switches 43_1 to 43_m are not necessary. Fig. 11 shows further another embodiment of the present

invention. A display device of Fig. 11 does not includes the scanning switches $3\lambda_1$ to $3\lambda_n$ in the scanning reverse bias circuit 13 as mentioned in the display device of Fig. 9 and it is designed to always apply the potential Vcc to the scanning the display controller 12 to the scanning reverse bias circuit is a bias control signal is not supplied. The other structure is the same as that of the display device of Fig. 9. It may be designed to apply the potential Vcc directly to the negative electrode lines of the EL elements of the light

In the display device constituted as shown in Fig. 11, the operation in the case where the display controller l2 makes the EL element 21 of the light emitting cell $20_{1,1}$ emit the will be described with reference to Fig. 12.

emitting cells $20_{1,1}$ to $20_{8,1}$ without passing through the

scanning lines Bl to Bn.

In the case of light emission of the EL element 21 in Fig. 11, the operation mode of the light emitting cell $20_{1,1}$ in includes a scanning mode for scanning the line of the light

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emitting cells $20_{1,1}$ to $20_{m,1}$ and a light emitting mode of making the EL element 21 emit light just after finishing the scan, as illustrated in Fig. 12.

In the scanning mode, the reverse bias switch 31, performs

a switching operation in accordance with a scanning signal from the display controller 12, to relay the potential Vcc to the reverse bias line Cl. Simultaneously with the relay operation, the current source 33, supplies a driving control to the driving line Al in accordance with a driving control signal from the display controller 12 to make the EL element signal from the display controller 12 to make the EL element signal from the display controller 33, is turned off.

current source 33_1 flows into the ground through the driving line Al, the diode 22, the capacitor 24, the reverse bias line Cl, and the reverse bias switch 31_1 . Namely, the driving current charges the capacitor 24 as a charging current.

Since the diode 22 turns on, the driving current from the

When the charging current flows, the negative electrode

potential Pb of the EL element 21 is Vcc, while the positive electrode potential Pd is lower than Vcc and about $7V+V\gamma$. Therefore, the EL element 21 is in a reverse bias state and emits no light.

Assuming that the charged capacity of the EL element 21

is defined as Cell and that the charged capacity of the capacitor 24 is defined as C24, Vy=Vcc×Cell/(Cell+C24). Vg means that the potential Vcc is divided by the two charged capacities Cell and C24. When the potential Vcc is set at a tairly high level and, for example, C24 is set two to four

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times larger than Cell so as to satisfy the relation of C24>Cell, the voltage Vell between the terminals of the EL Therefore, the EL element 21 is in a reverse bias state and is Therefore, the EL element 21 is in a reverse bias state and is Therefore, the EL element 21 is in a reverse bias state and is $\frac{1}{2} \int_{-\infty}^{\infty} \frac{1}{2} \int_$

When a scanning time assigned to the line of the light

emitting cells $20_{1,1}$ to $20_{m,1}$ passes, the contents of the scanning signal and the driving control signal from the display controller 12 are changed, the selected scanning line is shifted to the line of the light emitting cells $20_{1,2}$ to $20_{m,2}$ display controller 12 are changed, the selected scanning line emitting mode is started, the reverse bias switch 31_1 performs a switching operation to relay the potential Vcc to the reverse bias line Cl. Simultaneously with the switching operation, the current source 33_1 stops the supply of the driving current to the driving line Al and the switch 43_1 is turned on, alternatively, it supplies the driving current to the light emitting current to the light emitting current to source 33_1 stops in the supply of the supply of the fine driving line Al, for the light emission of the EL element of the light emitting cell at the light emitting cell at the supplies the switch of the light emitting line and the driving line Al and the switch 43_1 is specified scanning line and the driving line Al and the switch 43_1 is turned off.

In the Light emitting mode, the potential Pa of the driving driving line Al becomes OV and the potential Pc of the reverse bias line Cl rises up to Vcc when stopping the supply of the driving current to the driving line Al. The positive electrode potential Pd increases by a potential obtained by dividing the changed voltage Vcc of the potential Pc of the

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reverse bias line C1 according to the proportion of the two charged capacities Cell and C24, resulting in 7V+Vcc in accordance with a change from Vy to Vcc. Since the voltage Vell between the terminals of the EL element 12 becomes about 7V, the EL element 21 emits light. When the voltage of the EL element 21 in the forward direction becomes lower than the light emission threshold voltage Vth (for example, 3V) in accordance with a decrease of the accumulated charges, the EL element 21 stops the light emission and the light emitting accordance with a decrease of the accumulated charges, the EL element 21 stops the light emission and the light emitting

Even when the reverse bias switch 31^{3} has performed the

switching operation in accordance with a scanning signal from the display controller 12, for the purpose of scanning the limb of the light emitting cells $20_{1,1}$ to $20_{m,1}$, in the scanning mode where the EL element 21 does not emit light, the current current to the driving line Al and the switch 43_1 is turned on. The positive electrode potential Pd of the EL element 21 becomes about $3V+V\gamma$ and the EL element 21 turns into a reverse bias state. Thereafter, when a scanning time assigned to the line of the light emitting cells $20_{1,1}$ to $20_{m,1}$ passes and the selected scanning line is shifted to the light emitting cells $20_{1,2}$ to $20_{m,1}$ passes and the selected scanning line is shifted to the light

In the above-mentioned respective embodiments, although one light emitting cells, namely, a red light emitting cell, a green

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light emitting cell, and a blue light emitting cell are formed per one pixel in a color display matrix typed display panel. Further, in the above-mentioned respective embodiments,

although the operation of the light emitting cell $20_{1,1}$ has been described, the operations of the other light emitting cells $20_{1,2}$ to $20_{n,n}$ are the same as above.

As mentioned above, according to the present invention, in order to improve the average luminance, refresh action can be provided to the EL element to which a diode is connected in series, in a comparatively easy structure.

Claims

1. A Light emitting circuit for making an organic electroluminescence element emit light in response to a light emission instruction, comprising:

a first diode element in a same polarity direction in series,

a second diode element connected with said organic electroluminescence element at a connection point between said organic electroluminescence element and said first diode of organic electroluminescence element and said first diode element, in a direction contrary to the polarity direction of the first diode element,

driving current supplying means for supplying a driving current for light emission in the forward polarity direction to the serial circuit of said organic electroluminescence element and said first diode element in response to the light emission instruction, and

the serial circuit of said organic electroluminescence element forward polarity direction of said organic electroluminescence forward polarity direction of said organic electroluminescence

reverse bias application means for applying a voltage to

emit light.

2. A light emitting circuit according to claim 1, wherein said driving current supplying means includes a current source for supplying the driving current to one end of said first diode element on a side opposite to said connection point for

a predetermined period in response to the light emission instruction, and first switching means for supplying a reference potential to one end of said organic electroluminescence element on a side opposite to said connection point when the driving current is supplied by said nigher than the reference potential and lower than a first higher than the reference potential and lower than a first potential, to the one end of said organic electroluminescence potential, to the one end of said organic electroluminescence potential, to the one end of said organic electroluminescence potential, to the one end of said organic electroluminescence potential, to the one end of said organic electroluminescence potential, to the one end of said organic electroluminescence potential, to the one end of said organic electroluminescence potential, to the one end of said organic electroluminescence potential, to the one end of said organic electroluminescence potential, to the one end of said organic electroluminescence premeration.

switching means, after finishing the supply of the driving current by said current source, for supplying the first potential to one end of said second diode element on a side opposite to said connection point, and thereafter, supplying the reference potential to the one end of said second diode element on a side opposite to said connection point during a element on a side opposite to said connection point during a supplying the said of said organic electroluminescence element does not period when said organic electroluminescence element does not period element does not pe

said reverse bias application means includes second

current source, and

emit light.

3. A light emitting circuit according to claim 1, wherein said driving current supplying means includes a current source for supplying the driving current to one end of said first a predetermined period in response to the light emission instruction, first switching means for supplying a reference potential to one end of said organic electroluminescence potential to one end of said organic electroluminescence potential to one end of said connection point when the

driving current is supplied by said current source, and supplying a third potential, which is higher than the reference potential, to the one end of said organic supplied by said current source, and a switch for supplying the reference potential to one end of said first diode element on a side opposite to said connection point when the driving ourrent is not current is not supplied by said current source, and supplying the reference potential to one end of said first diode element on a side opposite to said connection point when the driving ourrent is not supplied by said current source, and

astd reverse bias application means includes second

switching means for supplying a second potential, which is higher than the third potential, to one end of said second diode element on a side opposite to said connection point when the driving current is supplied by said current by said current source, after source, supplying a first potential, which is higher than the second potential, to the one end of said second diode element, and thereafter, supplying the reference potential to the one end of said second diode element, and thereafter, supplying the reference potential to the one

4. A light emitting circuit according to claim 1, wherein said driving current supplying means includes a current source for supplying the driving current to one end of said first diode element on a side opposite to the light emission predetermined period in response to the light emission instruction, means for supplying a third potential, which is higher than a reference potential, to one end of said organic dectroluminescence element on a side opposite to said connection point, and a switch for supplying the reference connection point, and a switch for supplying the reference

potential to one end of said first diode element on a side opposite to the connection point when the driving current is not supplied by said current source, and

said reverse bias application means includes second switching means for supplying a second potential, which is higher than the third potential, to one end of said second diode element on a side opposite to said connection point when the driving current is supplied by said current source, after finishing the supply of the driving current by said current source, after source, supplying a first potential, which is higher than the second potential, to the one end of said second diode element, and thereafter, supplying the reference potential to the one end of said second diode element,

a display panel in which a plurality of light emitting

cells respectively including organic electroluminescence

least one light emitting cell to be driven to emit light of said light emitting cells in accordance with input image data; and

driving means for making an organic electroluminescence element being in the light emitting cell specified by said light emitting cell specified by said light

wherein said light emitting cell includes a first diode element connected with said organic electroluminescence

element in a same polarity direction in series, and
a second diode element connected with said organic
electroluminescence element at a connection point between said
organic electroluminescence element and said first diode
element, in a direction contrary to the polarity direction of
the first diode element, and

said driving means includes driving current supplying

means for supplying a driving current for light emission in the forward polarity direction to the serial circuit of said organic electroluminescence element and said first diode element in response to the light emission instruction, and reverse bias application means for applying a voltage to

the serial circuit of said organic electroluminescence element forward polarity direction of said organic electroluminescence forward polarity direction of said organic electroluminescence and said organic electroluminescence element when said organic electroluminescence element when said organic electroluminescence element when said organic electroluminescence element

6. A display device according to claim 5, wherein said light emitting cell specifying means specifies said light emitting cell to be driven emit light by sequentially scanning a plurality of lines of said display panel.

7. A light emitting circuit for making an organic electroluminescence element emit light in response to a light

a diode element connected with said organic in a torward polarity direction in

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emission instruction, comprising:

series:

emit light.

a capacitive element connected at the connection point of said organic electroluminescence element and said diode

element;

qriving current supplying means for supplying a driving

current in the forward direction to said organic electroluminescence element and said capacitive element through said diode element in response to the light emission instruction; and

reverse bias application means for applying a voltage to the serial circuit of said organic electroluminescence element and said capacitive element in the direction contrary to the forward polarity direction of said organic electroluminescence element when said organic electroluminescence

emit light.

8. A Light emitting circuit according to claim 7, further comprising light emission maintaining means for maintaining a potential difference between both ends of the serial circuit of said organic electroluminescence element and said capacitive element substantially at zero after finishing the supply of the driving current by said driving current

supplying means.

9. A light emitting circuit according to claim 7, wherein said driving current supplying means includes a current source for supplying the driving current to one end of said diode element on a side opposite to said connection point for a predetermined period in response to the light emission instruction, and first switching means for supplying a

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reference potential to one end of said organic electroluminescence element on a side opposite to the connection point when the driving current is supplied by said higher than the reference potential, to the one end of said organic electroluminescence element when the driving current organic electroluminescence element when the driving current is not supplied by said current source, and

switching means, after finishing the supply of the driving current by said current source, for supplying the first potential to one end of said capacitive element on a side opposite to said connection point, and thereafter, supplying the reference potential to the one end of said capacitive element during a period when said organic electroluminescence element does not emit light.

10. A light emitting circuit for making an organic

said reverse bias application means includes second

10. A light emitting circuit for making an organic emission instruction, comprising:

serres:
electroluminescence element in a forward polarity direction in

a capacitive element connected with said organic electroluminescence element at the connection point of said organic electroluminescence element and said diode element; this potential application means for applying a first

potential, which is higher than a reference potential, to one end of said organic electroluminescence element on a side

obbosite to the connection point;

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driving current supplying means for supplying a driving driving said diode element in the forward direction to said capacitive element through said diode element in response to the light emission current in the forward direction to said capacitive element

potential to one end of said capacitive element on a side of the driving current by said driving current supplying

second potential application means for applying the first

11. A display device comprising: a display panel in which a plurality of light emitting

elements are arranged in a matrix shape;

light emitting cell specifying means for specifying a said light emitting cells in accordance with imput image data; and

driving means for making an organic electroluminescence element emit light, said organic electroluminescence element

emitting cell specifying means,
wherein said light emitting cell includes a diode element
connected with said organic electroluminescence element in a

forward polarity direction in series, and a capacitive element connected at the connection point of said organic electroluminescence element and said diode

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element, and

said driving means includes driving current supplying a driving current in the forward direction to said organic electroluminescence element and said capacitive element through said diode element in response to the light emission instruction, and

reverse bias application means for applying a voltage to the serial circuit of said organic electroluminescence element and said capacitive element in the direction contrary to the forward polarity direction of said organic electroluminescence element when said organic electroluminescence element when said organic electroluminescence element light.

12. A display device according to claim il, wherein said thing cell to be driven emit light by sequentially scanning emitting cell to be driven emit light by sequentially scanning a plurality of lines of said display panel.

13. A display device comprising:

a display panel in which a plurality of light emitting

elements are arranged in a matrix shape;

Least one light emitting cells in accordance with input image data; and

Tight emitting cell specifying means for specifying a

driving means for making an organic electroluminescence element emit light, said organic electroluminescence element

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emitting cell specifying means,

said light emitting cell includes a diode element connected with said organic electroluminescence element in a forward polarity direction in series, and a capacitive element connected with said organic

electroluminescence element at the connection point of said organic electroluminescence element and said diode element, and

said driving means includes first potential application means for applying a first potential, which is higher than a reference potential, to one end of said organic electroluminescence element on a side opposite to the connection point,

driving current supplying means for supplying a driving through said diode element in response to the light emission instruction, and

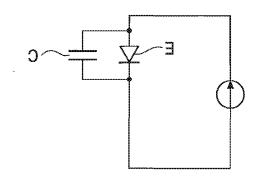
potential to one end of said capacitive element on a side opposite to said connection point, after finishing the supply of the driving current by said driving current supplying

second potential application means for applying the first

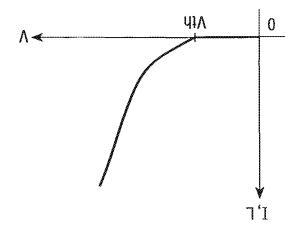
means.

14. A display device according to claim 11, wherein said emitting cell to be driven emit light by sequentially scanning emitting cell to be driven emit light by sequentially scanning

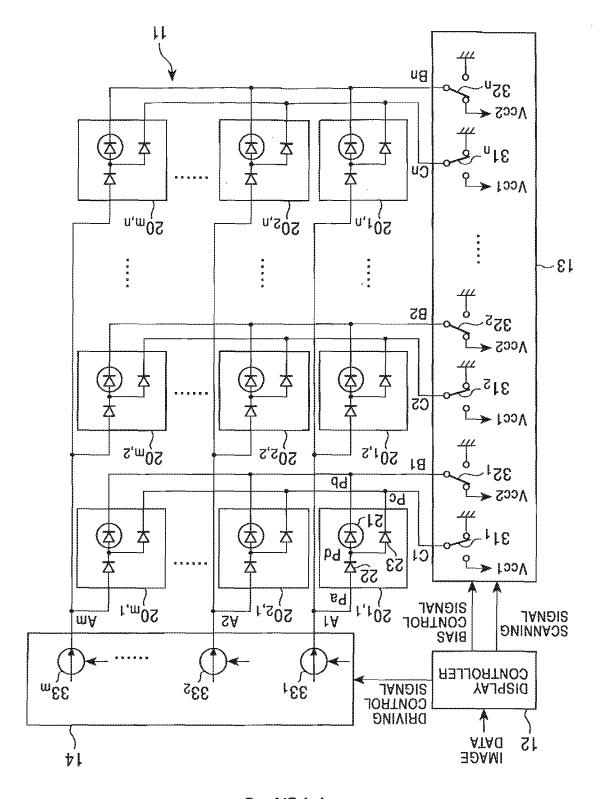
FIG. 1



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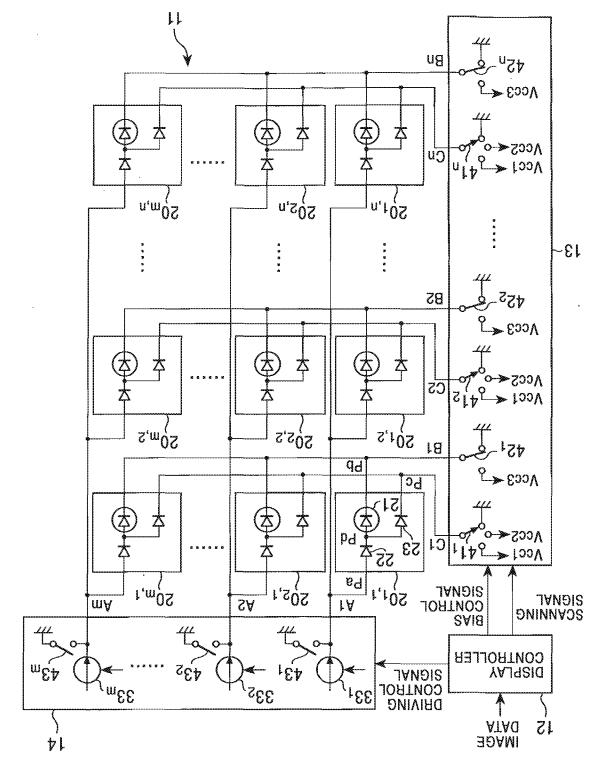


HC' 3



REVERSE BIAS APPLICATION MODE	CONTINUOUS MODE	MODE	SCANNING	OPERATING MODE
BIAS ON MODE	US MODE	NON- LIGHT EMISSION	LIGHT	IG MODE
VO	0V	0V	ABOUT 10V	POTENTIAL Pa
Vcc2	Vcc2	۷٥	0V	POTENTIAL Pb
VO	Vcc1	Vcc1	Vcc1	POTENTIAL Pb POTENTIAL Pc
۷0	Vcc2 + 5V	ABOUT 3V	ABOUT 7V	POTENTIAL Pd

FIG. 5

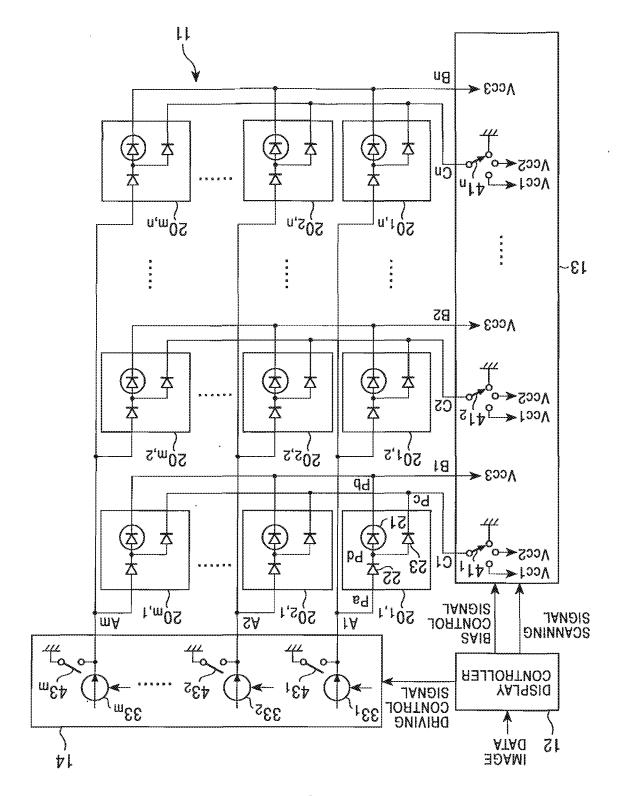


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REVERSE BIAS APPLICATION MODE	CONTINUOUS MODE	SCANNING MODE		OPERATING MODE
BIAS MODE	SSION MODE	NON- LIGHT EMISSION	LIGHT EMISSION	MODE
CURRENT SOURCE 33;: INACTIVE SWITCH 43;: ON	STATE CORRESPONDING TO ANOTHER SCANNING LINE	CURRENT SOURCE 331: INACTIVE SWITCH 431: ON	CURRENT SOURCE 33 ₁ : ACTIVE SWITCH 43 ₁ : OFF	OPERATING STATE
/E 0V		°E 0V	10V	POTENTIAL Pa
Vcc3	Vcc3	0V	۷0	POTENTIAL Pb
۷0	Vcc1	Vcc2	Vcc2	POTENTIAL Po
V#	Vcc3 + 5V	ABOUT 3V	ABOUT 7V	POTENTIAL Pd

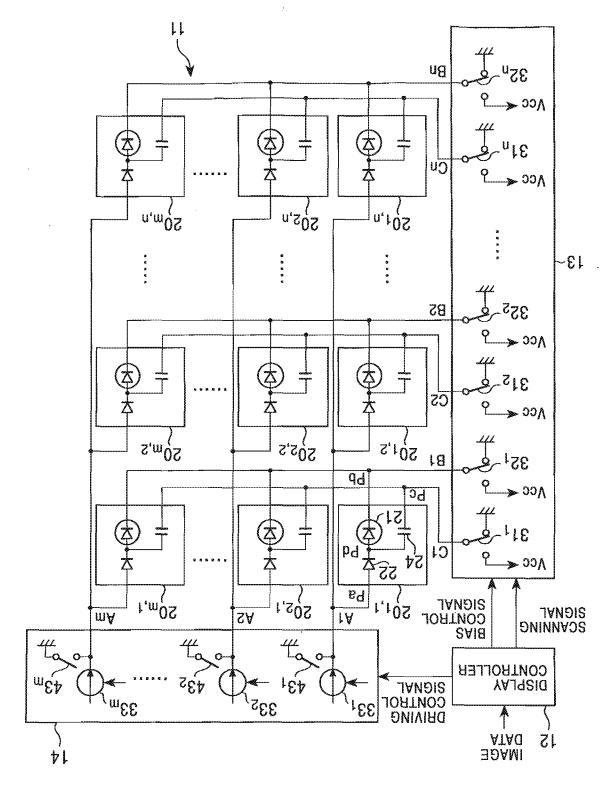
HC' \



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۷f	۷0	Vcc3	۷0	CURRENT SOURCE 331: INACTIVE SWITCH 431: ON	REVERSE BIAS APPLICATION MODE
Vcc3 + Vα	Vcc1	Vcc3	۷0	STATE CORRESPONDING TO ANOTHER SCANNING LINE	LIGHT EMISSION CONTINUOUS MODE
$Vcc3 + V\alpha - V\gamma$ $(V\alpha = 3V)$	Vcc2	Vcc3	۷0	CURRENT SOURCE 331: INACTIVE SWITCH 431: ON	MODE NON- LIGHT EMISSION
$Vcc3 + V\alpha - V\gamma$ $(V\alpha = 7V)$	Vcc2	Vcc3	ABOUT 10V	CURRENT SOURCE 331: ACTIVE SWITCH 431: OFF	LIGHT EMISSION
POTENTIAL PC POTENTIAL Pd	POTENTIAL Pc	POTENTIAL Pb	POTENTIAL Pa	OPERATING STATE	OPERATING MODE

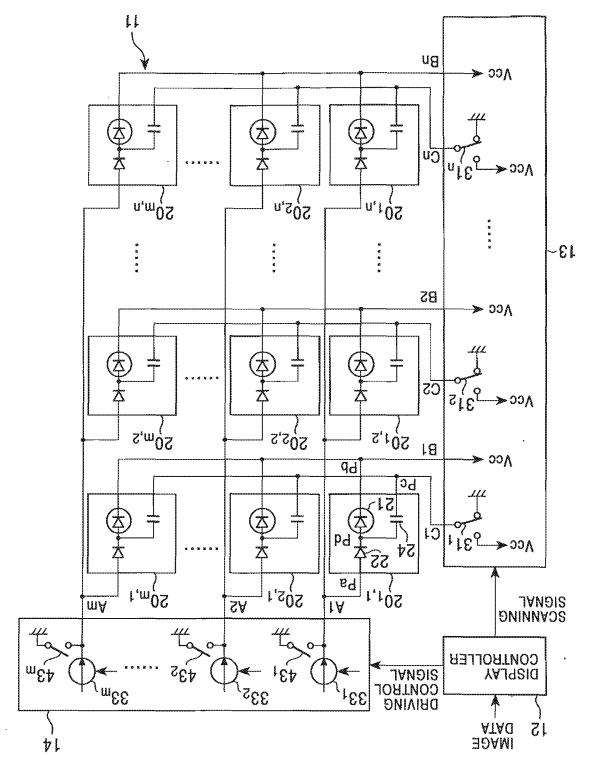
HIC' 8



νος + Vβ	0V	Vcc	0V	CURRENT SOURCE 331: INACTIVE SWITCH 431: ON	REVERSE BIAS APPLICATION MODE
Vcc + Vα	Vcc	Voc	0V	STATE CORRESPONDING TO ANOTHER SCANNING LINE	CONTINUOUS MODE
ABOUT 3V	0V	0V	0V	CURRENT SOURCE 331: INACTIVE SWITCH 431: ON	MODE NON- LIGHT EMISSION
ABOUT 7V	00	۷0	ABOUT 10V	CURRENT SOURCE 331: ACTIVE SWITCH 431: OFF	SCANNING LIGHT
POTENTIAL Pc POTENTIAL Pd	POTENTIAL Po	POTENTIAL Pb	POTENTIAL Pa	OPERATING STATE	OPERATING MODE

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HG. 11



MODE NO			SCANNING EM	OPERATING MODE
NON- LIGHT EMISSION	LIGHT EMISSION	NON- LIGHT EMISSION	LIGHT	MODE
LINE	STATE CORRESPONDING	CURRENT SOURCE 33 ₁ : INACTIVE SWITCH 43 ₁ : ON	CURRENT SOURCE 33 ₁ : ACTIVE SWITCH 43 ₁ : OFF	OPERATING STATE
۷0	0V	. V	ABOUT 10V	POTENTIAL Pa
Vcc	Vcc	Vcc	Vcc	POTENTIAL Pb
۷0	Vcc	۷0	0V	POTENTIAL Pc
3V + Vcc	7V + Vcc ~ 3V + Vcc	ABOUT 3V + Vcc	ABOUT 7V + Vcc	POTENTIAL Pd

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